

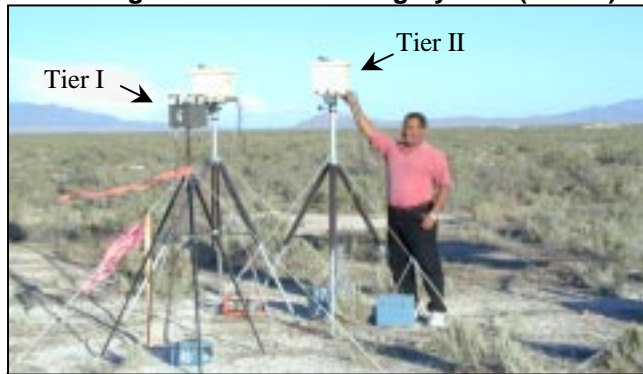


Edgewood Area - Aberdeen Proving Ground, Maryland 21010-5424

U.S. Army Soldier and Biological Chemical Command

# ***Integrated Biodetection Advanced Technology Demonstration Program (FY96-99)***

**Biological Aerosol Warning System (BAWS)**



**Attack Warning**

**Automated DNA Diagnostic (ADD)**



**Identification**

**Objective:** In FY96-99, the Soldier Biological and Chemical Command (SBCCOM) executed the Integrated Biodetection Advanced Technology Demonstration (ATD) Program to demonstrate two technologies: one that provides a pre-exposure warning for a biological attack, and another that provided an automated, increased identification sensitivity to agents while adding a first time virus identification capability with significantly reduced logistics. Both technologies became components of a remotely deployed Biological Attack Warning System (BAWS) which is a two-tiered remoted sensor system designed for pre-exposure warning accompanied by an automated DNA diagnostic device that provides rapid, post-attack RNA/DNA-based identification with significantly reduced consumables.

**Background:** The Integrated Biodetection Advanced Technology Demonstration (Bio-ATD) program was a 6.3 development effort that began in FY96 under Army Tech Base funding and continued through FY99 as a joint CBD Tech Base program since FY97. Historically, ATDs are Army 6.3 programs that became the models for the current DoD-ACTD programs. They are formalized through the process of developing and approving a Tech Demo Master Plan, which requires final signature approval at the highest levels of SBCCOM, JPOBD (for the current ATD), AMC, TRADOC, and SARDA.

ATDs are designed to demo a new battlefield capability and are judged by their ability to meet certain Exit Criteria that are agreed to beforehand by both the materiel developer (SBCCOM) and the uniformed user (Maneuver Support Battle Laboratory, MSBL, Ft. Leonard-Wood, MO). They conclude with a Battle Laboratory Warfighting Exercise (BLWE) that involves the user (soldiers) and is independently scored by the Battle Laboratory. The Bio-ATD developed and demonstrated two-technological capabilities: pre-exposure remote attack warning sensors and an automated, post-attack DNA diagnostic identifier, which are integral components of an overall Biological Attack Warning System (BAWS).

The BAWS employs a 2-Tiered state-of-the art lightweight, remote, battery/vehicle-powered network of sensors radio-linked to a central base station where the remote status of all sensors is graphically displayed. Tier I sensors comprise a network of highly sophisticated remote aerosol particle counters with on-board GPS, Meteorological sensors, full-duplex telemetry, sampling and data-handling. They provide the capability of alerting to a sudden high increase in aerosol particle concentration over a small area such as that expected from a close-in scud/bomblet attack. They also contain external sensor interfaces to the fielded M22 ACADA Chemical Detector and a Tier II sensor. Current, third-generation, size/weight/power parameters are: 0.24 cu.ft., 9-lbs, 8.44W. The Tier II sensors comprise a smaller but more capable system of sophisticated 3-channel UV-aerosol particle identifiers designed to detect and discriminate, in high ambient backgrounds, low agent-aerosol particle concentrations (< 10 particles/liter) such as those expected in a large area bio-attack (UAV, aircraft). They also serve the secondary mission of an unmasking indicator. Current Tier II size/weight/power parameters are 0.8 cu.ft., 18-lbs, 35W. For medical prophylaxis purposes, post-attack identification of the bio-agent is accomplished by a soldier in MOPP retrieving an automatically-collected aerosol sample from a BAWS Tier I sensor and transporting it to the automated DNA-based identification system. Besides the normal threat agents, it will identify RNA-based viruses and engineered organisms.

**Transitions:** By all previous accounts, this ATD has been judged successful. In OSD-sponsored Joint Field Trials 3 & 4 (1996-7), the BAWS was judged either first or second overall in the outdoor trigger trials. The particle counting technology in the Tier I sensors has been transitioned to three Joint Service programs (Portal Shield, JBPDS (Joint Biological Point Detection System) and the current JBREWS (Joint Biological Remote Early Warning System) program. In addition, 15-Tier II BAWS-units are currently being fabricated for insertion into the Block I JBPDS program for the man-portable and shelter JBPDS versions as replacements for the current trigger/detector systems. The ADD system was awarded the 1998 IR-100 Award by R&D Magazine and is featured in the Sep, 1998 issue. It was independently judged as one of the most significant 100 new technologies of 1998

**Battle Laboratory Warfighting Experiment (BLWE):** In FY99, a 3-Phase Battle Laboratory Warfighting Exercise (BLWE) was executed. Phase-1 was a series of background measurements (1998-99) at a number of CONUS (10 in all) and OCONUS (Kuwait) military facilities to develop reliable alarm algorithms. Phase-2 was a series of live exercises (1-30 Jun 99) with the BAWS system at Dugway Proving Ground, UT conducted with soldiers, marines, airmen from the Maneuver Support Battle Laboratory, Ft. Leonard-Wood, MO, Special Operations Command, Ft. Lewis, WA, USMC-Camp Pendleton, CA, and the Armed Forces Institute of Pathology, Bethesda, MD. Phase-3 involved participation in two high-level joint military exercises: Operation Ulchi Focus Lens and Joint Expeditionary Force-99 (JEFX-99), conducted in Aug 99 with the BAWS at the Yakima, WA and Indian Springs, NV sites.

Extremely positive user comments were generated from the SOF, USMC, and USAF participants with invitations being extended for future exercises. At JEFX-99, the BAWS system generated intense positive interest from USAF personnel and was briefed to the USAF Chief of Staff, GEN Ryan and ca. 152 USAF officers at the COL or higher level.

**Scientific Accomplishments:** This is the first-ever successful development of a real-time, lightweight biological-agent alarm. Besides obvious military applications, BAWS will see increased use in countering domestic terrorist threats. A number of federal law enforcement agencies are currently examining its utility in scheduled field exercises. This is also the first-ever development of an automated DNA-based identification system which will see increased use in medical as well as military applications. Both of these successes were accomplished under U.S. Army sponsorship.

**Summary:** The FY96-99 Integrated Biodetection Advanced Technology Demonstration (ATD) was formally concluded on 30 Dec 99 with the publication of the final DTLOMS\* Report dated 30 Dec 99. Over the course of this 4-year program, three prototype generations of a lightweight,

easily deployable, pre-exposure Biological Aerosol Warning System (BAWS) were developed and tested. Testing included 227 outdoor simulant challenges at Dugway Proving Ground, UT, background collection trials at 11-CONUS and 2-OCONUS military sites, actual BW-agent chamber tests and participation in two military exercises in FY99 (Ulchi Focus Lens and Joint Expeditionary Force-99). The final system configuration for a 30-day mission load, which included 20-Tier I sensor hubs, 1-Tier II UV sensor, twenty tripods, batteries, base station and rapid DNA-based identifier with expendables, occupied 1/3 of a standard 463L-airframe pallet. Letter endorsements for the BAWS system have been received from the Commander, U.S. Marine Forces Pacific, Commander, U.S. Army Maneuver Support Battle Laboratory and the U.S. Army Chemical School. Technologies developed in this ATD have been transitioned to the Joint Program Office for Biological Defense.

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\*Doctrine, Training, Leader Development, Organization, Materiel, Soldier/Personnel Integration Report, 30 Dec 99.